WHAT IS CLAIMED IS:

1. A controller for generating an ON-time for a buck regulator receiving a regulator input voltage and generating a regulated output voltage, said controller comprising:

circuitry for sensing said regulated output voltage and generating a sensed output voltage proportional to said regulated output voltage;

circuitry for adding a first voltage ramp to said sensed output voltage to generate a modified sensed output voltage;

circuitry for adding a second voltage ramp to a first reference voltage to generate a ripple reference voltage;

circuitry for processing said ripple reference voltage to generate a modified reference voltage;

circuitry for comparing said modified sensed output voltage to said modified reference voltage generating a comparator output having a first logic state when said modified sensed output voltage is greater than said modified reference voltage and a second logic state when said modified sensed output voltage is less than said modified reference voltage; and

circuitry for generating a control signal having a first logic state during said ON-time in response to said comparator output, said regulator input voltage and a second reference voltage, wherein said regulated output voltage receives energy directly from said regulator input voltage during said ON-time and said regulated output voltages receives stored energy from said regulator input voltage after said ON-time terminates.

2. The controller of claim 1, wherein said first and second voltage ramps are generated in response to a common voltage ramp and are substantially equal.

3. The controller of claim 2, wherein said circuitry for processing said ripple reference voltage comprises:

circuitry for sampling and tracking said ripple reference voltage when said ON-time has terminated; and

circuitry for holding a value of said ripple reference voltage as said modified reference voltage during said ON-time.

4. The controller of claim 3, wherein said second reference voltage is substantially equal to said first reference voltage.

5. The controller of claim 4 further comprising a ramp circuit for generating said common ramp voltage in response to a load current of said regulated output voltage flowing in a sense resistance.

6. The controller of claim 5, wherein said sense resistance corresponds to a sense resistor in series with said regulated output voltage.

7. The controller of claim 5, wherein said sense resistance corresponds to a switch resistance of a first electronic switch that is gated OFF when said ON-time starts and is gated ON when said ON-time has terminated, wherein said first electronic switch conducts said load current when gated ON.

8. The controller of claim 4 further comprising a ramp circuit for generating said common ramp voltage in response to charging a capacitor with a constant current when said ON-time has terminated and discharging said capacitor during said ON-time.

9. The controller of claim 8, wherein said circuitry for adding said first voltage ramp to said sensed output voltage comprises:

a first resistor having a first terminal coupled to said sensed output voltage and a second terminal; and

a voltage-to-current converter having an input coupled to said control voltage ramp, a first output generating a first current ramp, and a second output generating a second current ramp, wherein said first output is coupled to said second terminal of said first resistor and said modified sensed output voltage is generated at said second terminal in response to said first current ramp flowing in said first resistor.

10. The controller of claim 9, wherein said circuitry for adding said second voltage ramp to said first reference voltage comprises a second resistor having a first terminal coupled to said first reference voltage and a second terminal coupled to said second output of said voltage to current converter, wherein said ripple reference voltage is generated at said second terminal of said second resistor in response to said second current ramp flowing in said second resistor.

11. The controller of claim 9, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp, and second output generating said second current ramp.

12. The controller of claim 9, wherein said voltage-to-current converter is a current mirror circuit.

13. The controller of claim 6, wherein said circuitry for adding said first voltage ramp to said sensed output voltage comprises:

a first resistor having a first terminal coupled to said sensed output voltage and a second terminal; and

a voltage-to-current converter having an input coupled to said control voltage ramp, a first output generating a first current ramp, and a second output generating a second current ramp, wherein said first output is coupled to said second terminal of said first resistor and said modified sensed output voltage is generated at said second terminal of said first resistor in response to said first current ramp flowing in said first resistor.

14. The controller of claim 13, wherein said circuitry for adding said second voltage ramp to said first reference voltage comprises a second resistor having a first terminal coupled to said first reference voltage and a second terminal coupled to said second output of said voltage-to-current converter, wherein said ripple reference voltage is generated at said second terminal of said second resistor in response to said second current ramp flowing in said second resistor.

15. The controller of claim 13, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp, and second output generating said second current ramp.

16. The controller of claim 7, wherein said ramp circuit comprises:

circuitry for sampling and tracking a voltage across said sense resistance when said ON-time has terminated; and

circuitry for holding a value of said voltage across said sense resistance as said control ramp voltage during said ON-time.

17. The controller of claim 16, wherein said circuitry for adding said first voltage ramp to said sensed output voltage comprises:

a first resistor having a first terminal coupled to said sensed output voltage and a second terminal; and

a voltage-to-current converter having an input coupled to said control voltage ramp, a first output generating a first current ramp, and a second output generating a second current ramp, wherein said first output is coupled to said second terminal and said modified sensed output voltage is generated at said second terminal of said first resistor in response to said first current ramp flowing in said first resistor.

18. The controller of claim 17, wherein said circuitry for adding said second voltage ramp to said first reference voltage comprises a second resistor having a first terminal coupled to said first reference voltage and a second terminal coupled to said second output of said voltage to current converter, wherein said ripple reference voltage is generated at said second terminal of said second resistor in response to said second current ramp flowing in said second resistor.

19. The controller of claim 17, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp and second output generating said second current ramp.

20. The controller of claim 2, wherein said circuitry for processing said ripple reference voltage comprises a low pass filter circuit having an input coupled to said ripple reference voltage and an output generating said modified reference voltage.

21. The controller of claim 20, wherein said first reference voltage is generated by an offset circuit comprising:

a differential transconductance amplifier having a positive input coupled to said regulated output voltage, a negative input coupled to said second reference voltage, and generating a reference current output as a gain times a difference between said regulated output voltage and said second reference voltage, wherein said reference current is coupled to a capacitor that integrates said reference current generating said first reference voltage.

22. The controller of claim 21 further comprising a ramp circuit for generating a first control ramp voltage in response to a load current of said regulated output voltage flowing in a sense resistance.

23. The controller of claim 22, wherein said sense resistance corresponds to a switch resistance of a first electronic switch that is gated OFF when said ON-time starts and is gated ON when said ON-time has terminated, wherein said first electronic switch conducts said load current when gated ON.

24. The controller of claim 23, wherein said ramp circuit comprises:

circuitry for sampling and tracking a voltage across said sense resistance when said ON-time has terminated; and

circuitry for holding a value of said voltage across said sense resistance as said control ramp voltage during said ON-time.

25. The controller of claim 24, wherein said circuitry for adding said first voltage ramp to said sensed output voltage comprises:

a first resistor having a first terminal coupled to said sensed output voltage and a second terminal; and

a first voltage-to-current converter having an input coupled to said first control voltage ramp, a first output generating a first current ramp, and a second output generating a second current ramp, wherein said first output is coupled to said second terminal of said first resistor and said modified sensed output voltage is generated at said second terminal in response to said first current ramp flowing in said first resistor.

26. The controller of claim 25, wherein said circuitry for adding said second voltage ramp to said first reference voltage comprises a second resistor having a first terminal coupled to said first reference voltage and a second terminal coupled to said second output of said voltage to current converter, wherein said ripple reference voltage is generated at said second terminal of said second resistor in response to said second current ramp flowing in said second resistor.

27. The controller of claim 25, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp, and second output generating said second current ramp.

28. The controller of claim 27 further comprising:

circuitry for adding a third voltage ramp to said sensed output voltage; and

circuitry for adding a fourth voltage ramp to said first reference voltage.

29. The controller of claim 28 further comprising a second ramp circuit for generating a second control ramp voltage in response to charging a capacitor with a constant current when said ON-time has terminated, wherein said capacitor is discharged during said ON-time.

30. The controller of claim 29, wherein said circuitry for adding said third voltage ramp to said sensed output voltage further comprises a second voltage-to-current converter having an input coupled to said second control voltage ramp, a third output generating a third current ramp, and a fourth output generating a fourth current ramp, wherein said third output is coupled to said second terminal of said first resistor, wherein said modified sensed output voltage is further modified in response to said third current ramp flowing in said first resistor.

31. The controller of claim 30, wherein said circuitry for adding said fourth voltage ramp to said first reference voltage further comprises coupling said fourth output said second terminal of said second resistor, wherein said modified reference voltage is further modified in response to said fourth current ramp flowing in said second resistor.

32. The controller of claim 30, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp, and second output generating said second current ramp.

33. A system comprising:

a processor;

a memory for storing instructions and data for said processor;

a display interface for coupling signals from said processor to a display device;

a user interface for coupling signals from a user to said processor; and

a buck regulator receiving a regulator input voltage and generating a regulated output voltage for said system, an ON-time of said buck regulator controlled by a constant ON-time controller having;

circuitry for sensing said regulated output voltage and generating a sensed output voltage proportional to said regulated output voltage;

circuitry for adding a first voltage ramp to said sensed output voltage to generate a modified sensed output voltage;

circuitry for adding a second voltage ramp to a first reference voltage to generate a ripple reference voltage;

circuitry for processing said ripple reference voltage to generate a modified reference voltage;

circuitry for comparing said modified sensed output voltage to said modified reference voltage generating a comparator output having a first logic state when said modified sensed output voltage is greater than said modified reference voltage and a second logic state when said modified sensed output voltage is less than said modified reference voltage; and

circuitry for generating a control voltage having a first logic state during said ON-time in response to said comparator output, said regulator input voltage and a second reference voltage, wherein said regulated output voltage receives energy directly from said regulator input voltage during said ON-time and said regulated

output voltages receives stored energy from said regulator input voltage after said ON-time terminates.

34. The system of claim 33, wherein said first and second voltage ramps are generated in response to a common voltage ramp and are substantially equal.

35. The system of claim 34, wherein said circuitry for processing said ripple reference voltage comprises:

circuitry for sampling and tracking said ripple reference voltage when said ON-time has terminated; and

circuitry for holding a value of said ripple reference voltage as said modified reference voltage during said ON-time.

36. The system of claim 35, wherein said second reference voltage is substantially equal to said first reference voltage.

37. The system of claim 36 further comprising a ramp circuit for generating said common ramp voltage in response to a load current of said regulated output voltage flowing in a sense resistance.

38. The system of claim 37, wherein said sense resistance corresponds to a sense resistor in series with said regulated output voltage.

39. The system of claim 37, wherein said sense resistance corresponds to a switch resistance of a first electronic switch that is gated OFF when said ON-time starts and is gated ON when said ON-time has terminated, wherein said first electronic switch conducts said load current when gated ON.

40. The system of claim 36 further comprising a ramp circuit for generating said common ramp voltage in response to charging a capacitor with a constant current when said ON-time has terminated and discharging said capacitor during said ON-time.

41. The system of claim 40, wherein said circuitry for adding said first voltage ramp to said sensed output voltage comprises:

a first resistor having a first terminal coupled to said sensed output voltage and a second terminal; and

a voltage-to-current converter having an input coupled to said control voltage ramp, a first output generating a first current ramp, and a second output generating a second current ramp, wherein said first output is coupled to said second terminal of said first resistor and said modified sensed output voltage is generated at said second terminal in response to said first current ramp flowing in said first resistor.

42. The system of claim 41, wherein said circuitry for adding said second voltage ramp to said first reference voltage comprises a second resistor having a first terminal coupled to said first reference voltage and a second terminal coupled to said second output of said voltage to current converter, wherein said ripple reference voltage is generated at said second terminal of said second resistor in response to said second current ramp flowing in said second resistor.

43. The system of claim 41, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp, and second output generating said second current ramp.

44. The system of claim 41, wherein said voltage-to-current converter is a current mirror circuit.

45. The system of claim 38, wherein said circuitry for adding said first voltage ramp to said sensed output voltage comprises:

a first resistor having a first terminal coupled to said sensed output voltage and a second terminal; and

a voltage-to-current converter having an input coupled to said control voltage ramp, a first output generating a first current ramp, and a second output generating a second current ramp, wherein said first output is coupled to said second terminal of said first resistor and said modified sensed output voltage is generated at said second terminal of said first resistor in response to said first current ramp flowing in said first resistor.

46. The system of claim 45, wherein said circuitry for adding said second voltage ramp to said first reference voltage comprises a second resistor having a first terminal coupled to said first reference voltage and a second terminal coupled to said second output of said voltage-to-current converter, wherein said ripple reference voltage is generated at said second terminal of said second resistor in response to said second current ramp flowing in said second resistor.

47. The system of claim 45, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp, and second output generating said second current ramp.

48. The system of claim 39, wherein said ramp circuit comprises:

circuitry for sampling and tracking a voltage across said sense resistance when said ON-time has terminated; and

circuitry for holding a value of said voltage across said sense resistance as said control ramp voltage during said ON-time.

49. The system of claim 48, wherein said circuitry for adding said first voltage ramp to said sensed output voltage comprises:

a first resistor having a first terminal coupled to said sensed output voltage and a second terminal; and

a voltage-to-current converter having an input coupled to said control voltage ramp, a first output generating a first current ramp, and a second output generating a second current ramp, wherein said first output is coupled to said second terminal and said modified sensed output voltage is generated at said second terminal of said first resistor in response to said first current ramp flowing in said first resistor.

50. The system of claim 49, wherein said circuitry for adding said second voltage ramp to said first reference voltage comprises a second resistor having a first terminal coupled to said first reference voltage and a second terminal coupled to said second output of said voltage to current converter, wherein said ripple reference voltage is generated at said second terminal of said second resistor in response to said second current ramp flowing in said second resistor.

51. The system of claim 49, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp and second output generating said second current ramp.

52. The system of claim 34, wherein said circuitry for processing said ripple reference voltage comprises a low pass filter circuit having an input coupled to said ripple reference voltage and an output generating said modified reference voltage.

53. The system of claim 52, wherein said first reference voltage is generated by an offset circuit comprising:

a differential transconductance amplifier having a positive input coupled to said regulated output voltage, a negative input coupled to said second reference voltage, and generating a reference current output as a gain times a difference between said regulated output voltage and said second reference voltage, wherein said reference current is coupled to a capacitor that integrates said reference current generating said first reference voltage.

54. The system of claim 53 further comprising a ramp circuit for generating a first control ramp voltage in response to a load current of said regulated output voltage flowing in a sense resistance.

55. The system of claim 54, wherein said sense resistance corresponds to a switch resistance of a first electronic switch that is gated OFF when said ON-time starts and is gated ON when said ON-time has terminated, wherein said first electronic switch conducts said load current when gated ON.

56. The system of claim 55, wherein said ramp circuit comprises:

circuitry for sampling and tracking a voltage across said sense resistance when said ON-time has terminated; and

circuitry for holding a value of said voltage across said sense resistance as said control ramp voltage during said ON-time.

57. The system of claim 56, wherein said circuitry for adding said first voltage ramp to said sensed output voltage comprises:

a first resistor having a first terminal coupled to said sensed output voltage and a second terminal; and

a first voltage-to-current converter having an input coupled to said first control voltage ramp, a first output generating a first current ramp, and a second output generating a second current ramp, wherein said first output is coupled to said second terminal of said first resistor and said modified sensed output voltage is generated at said second terminal in response to said first current ramp flowing in said first resistor.

58. The system of claim 57, wherein said circuitry for adding said second voltage ramp to said first reference voltage comprises a second resistor having a first terminal coupled to said first reference voltage and a second terminal coupled to said second output of said voltage to current converter, wherein said ripple reference voltage is generated at said second terminal of said second resistor in response to said second current ramp flowing in said second resistor.

59. The system of claim 57, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp, and second output generating said second current ramp.

60. The system of claim 59 further comprising:

circuitry for adding a third voltage ramp to said sensed output voltage; and

circuitry for adding a fourth voltage ramp to said first reference voltage.

61. The system of claim 60 further comprising a second ramp circuit for generating a second control ramp voltage in response to charging a capacitor with a constant current when said ON-time has terminated, wherein said capacitor is discharged during said ON-time.

62. The system of claim 61, wherein said circuitry for adding said third voltage ramp to said sensed output voltage further comprises a second voltage-to-current converter having an input coupled to said second control voltage ramp, a third output generating a third current ramp, and a fourth output generating a fourth current ramp, wherein said third output is coupled to said second terminal of said first resistor, wherein said modified sensed output voltage is further modified in response to said third current ramp flowing in said first resistor.

63. The system of claim 62, wherein said circuitry for adding said fourth voltage ramp to said first reference voltage further comprises coupling said fourth output said second terminal of said second resistor, wherein said modified reference voltage is further modified in response to said fourth current ramp flowing in said second resistor.

64. The system of claim 62, wherein said voltage-to-current converter comprises two transconductance amplifiers having a common input coupled to said control voltage ramp, said first output generating said first current ramp, and second output generating said second current ramp.